

This species ranges from the Red Sea to the Loyalty Islands and Funafuti, and has also been found at Singapore, Amboyna, and the Philippines. Mr. Andrews's collection comprises three specimens. They all showed the reddish flesh-tint which Semper says characterizes the female when alive, the male being a dark brown.

SIPUNCULUS Linn.

6. SIPUNCULUS EDULIS Lamarck.

Lamarck, Animaux sans Vertèbres, 1st ed. vol. iii. p. 79.

Sluiter, Natuurk. Tijdschr. Nederl. Ind., Bd. xli. p. 148, Bd. xlv. p. 484.

Shipley, Zoological Results etc. Willey, Cambridge, pt. ii. 1898.

This species, which is eaten by the Chinese, is very variable in character and approaches *S. cumatensis* in many features. The two specimens collected at Christmas Island were of a decidedly pinkish hue, which faded at places into a greyish yellow.

5. Notes on the *Coralliidæ* of Madeira, with Descriptions of two new Species. By JAMES YATE JOHNSON, C.M.Z.S.

[Received December 3, 1898.]

(Plates V.-VII.)

Fam. CORALLIIDÆ.

Gen. PLEUROCORALLIUM Gray

(including *Hemicorallium* Gray).

The genus *Pleurocorallium* is distinguished from the genus *Corallium* by the following characteristics:—All the species branch in one plane; the prominent polype-cells are seated on one face of the branches; and a spicule shaped like a binocular opera-glass or like two carafes united at the sides is present in the cortical cœnenchyma.

Madeira appears to be the headquarters of this genus, three of the four known species being found there. The fourth species (*Pl. secundum* Dana) is doubtfully attributed to the Sandwich Islands, and its variety, *elatior* Ridley, to Japan.

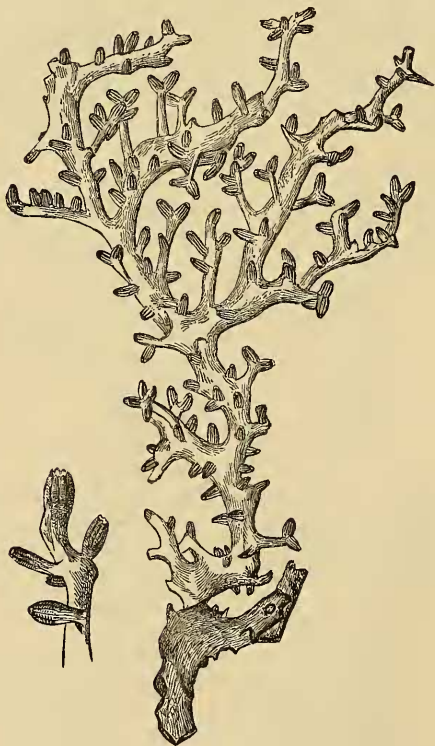
There can be no doubt that the hard axis of these corals is capable of taking a polish, and might be worked up into ornamental articles having a commercial value if the corals occurred more abundantly. As it is, specimens are met with so rarely that the demands of museums of natural history cannot be supplied.

It may be remarked here that although the *Corallium rubrum* or *C. nobile* of authors is found in the Mediterranean, which is to the north of Madeira, and at the Cape Verd Islands, 900 miles to

the south, it has never yet been discovered at Madeira. But it is not impossible that the dredges of the Prince of Monaco may alight upon its lurking-place when his well-equipped exploring yacht comes to work over this part of the bed of the Atlantic.

1. *PLEUROCORALLIUM TRICOLOR*, sp. nov. (Plate VII. fig. 3.)

Branching subalternately in one plane to the fourth degree of subdivision; branches flexuose, not coalescing, elliptical in section, attenuating upwards, the ultimate branches slender and ending in points. Axis hard, white, its surface smooth. Cortex pale yellow, granulated. Polype-cells pale vermilion-red, very prominent, subpedicellate, ovoid or subconical, 2.5-3 millim. long, less



*Pleurocorallium tricolor.*

than 2 millim. in diameter. The upper part is divided into eight upright lobes standing round the orifice in a close circle. The cells are numerous and are irregularly scattered on the anterior face of the branches; the ultimate branchlets have usually two, sometimes three cells at their tips. (The cells are shown about  $2\frac{1}{2}$  times the natural size in the accompanying figure to the left.)

The spicula of the cortex comprise three forms:—(1) Spicules shaped like an opera-glass or like two carafes joined at the sides and having two necks; the bodies are coarsely tuberculated and the ends of the necks are set with a cycle of conical tubercles. (2) Small, cylindrical, stout with two whorls, each of four thick rays, on the shaft at right angles thereto; the projecting ends of the shaft with the two whorls of rays make up a ten-rayed spicule; the ends of all the rays are tuberculated. (3) Numerous irregularly formed spicules which may be compared to balls with several thick rays: they seem allied to the last form, but neither axial shaft nor whorls of rays can be made out. In addition to these forms the polype-cells yield (4) numerous monaxile spicules about one and a half times the length of the spicule (2); some are cylindrical, others fusiform or clavate, and all are more or less tuberculated; (5) a few cruciform spicula varied in form and usually imperfect, but consisting essentially of four tapering arms at right angles to each other, their bases meeting at the centre with equal acute angles. (The spicula are figured on Plate VII. fig. 3.)

This species is less robust than the other two here described, so far as can be judged from the few known specimens. Three examples have been obtained at Madeira at different times, but for many years no others have occurred. The largest specimen was presented to the British Museum, and a second, smaller, but with perfect cells, was given to the Liverpool Museum. With these two specimens before him, Dr. Gray (P. Z. S. 1867, p. 126) assigned the latter to his *Hemicorallium johnsoni*, saying it was evidently the same species and showed the coral in its young state. His paper is illustrated by a good woodcut (here reproduced, see p. 58), which displays the entire specimen and the polype-cells. The cells are unfortunately very fragile, and drop off from the dry coral at the slightest touch or jar.

The specimen in the British Museum is without its base; it has a height of 170 millim. ( $6\frac{3}{4}$  in.) and the branches have a spread of about the same. The stem below the branches has a diameter of 6 millim. There are four principal branches, which in their lower parts vary in thickness from 4 to 7 millim.; above, they taper gradually and throw off tertiary and quaternary branchlets, which are seen to end in sharp points where stripped of the cortex. Two of the branches were quite dead long before the coral came from the sea, as was shown by the number of the plant-like polypiaries of hydroid zoophytes attached to them. The branches are often curiously perforated and tunnelled longitudinally on their anterior faces, and at these places are thicker than elsewhere. Boring animals appear to have attacked them, and it would seem as if fresh stony matter had been secreted so as to cover over the passages which are open at both ends, and the longer ones have usually a series of large openings at the sides. Sometimes a portion of the branch itself has been removed; at other places the stony axis does not appear to have suffered. One tunnel measured 35 millim. in length and had eleven openings at one side.

2. *PLEUROCORALLIUM MADERENSE*, sp. nov. (Plates V. & VII. figs. 1 & 4.)

Branching luxuriantly in one plane to the seventh or eighth degree of subdivision. Ramification close, dense. Branches irregularly flexuose, not anastomosing. The ultimate branches, when stripped of their cortex and cells, are seen to taper to a fine point.

The white axis is hard, compact, elliptical in transverse section, and its surface is smooth. The thin cortex is coloured a pale ochraceous yellow when the coral is fresh from the sea. Its surface is minutely papillate or granular. The polype-cells or calyces are very numerous and are all seated on the anterior aspect of the branches, mostly at their sides or at the tips of the ultimate branchlets. They are prominent, cylindrical, about 2 millim. long and 1 millim. in diameter. Their sides are marked with eight vertical ribs, and the mouths are surrounded by eight upright bundles of spicula forming an oval termination of the cell. The polypes have an orange colour.

Five forms of spicula are found in this species, viz.:—(1) numerous double carafes with two necks; (2) a few of the short two-whorled cylindrical rods or staves; (3) irregular rayed balls; (4) elongate, cylindrical, fusiform or clavate, tuberculated; (5) cruciform. All these agree more or less closely with the correspondingly numbered spicula of the preceding species. (See Plate VII. figs. 1 & 4.)

If the spicula alone were regarded, this species is more closely allied to the first than to the third species here described, but it is widely separated from the former by habit and coloration. From the following species, which agrees with it in coloration, it is distinguished by its much greater degree of ramification and the consequent greater density and delicacy of the branches; by the smooth, not striated surface of the hard axis under the cortex; by the form of the polype-cells, which are cylindrical, not hemispherical and wart-like; by the presence in the cortex of irregularly formed ball-like spicula and of a few cruciform spicula; and finally by the absence of the smooth form of double carafe spicule.

Only a single specimen of this very beautiful coral is known, and that was obtained so lately as the summer of this year (1898) by the Rev. Padre Ernesto Schmitz, late Director of the Episcopal Seminario, Funchal, from a fisherman who told him it had been brought up a few days previously by a fishing-line from deep water off Camara de Lobos, a village six miles to the west of Funchal. The specimen has been placed in the Museum of the Seminario, and a short description of it will now be given<sup>1</sup>.

The base is wanting, the stem having been broken away from it. The height of what remains is 30 centim., or about 12 inches,

<sup>1</sup> For copies of the photographs of the entire corals from which the illustrations on Plates V. & VI. have been taken, I am greatly indebted to the kindness of the Rev. Padre Ernesto Schmitz, the founder of the Seminario Museum, Funchal, and for many years its indefatigable curator.



and the spread of the branches is nearly the same. The ramification is so dense that the coral resembles the thickly-leaved branch of a tree. In several places one layer of branches stands in front of another layer, but in both cases the polype-cells are on the anterior faces of the branches. The longer axis of the broken end of the stem measures 17 millim. There are three main branches, one of which has been broken off short, and this gives the coral a lopsided appearance. Here and there the main branches widen out in an irregular manner. This may probably be owing to the fact that boring animals have excavated the axis at these places, for in the lower part of the stem such excavations are seen where the spiculiferous cœnenchyma has been removed.

Upon the specimen were seated some interesting zoophytes that rarely occur at Madeira—(1) a branched Alcyonarian (probably *Suberia* sp.), 100 millim. high with a spread of 80; (2) four fine specimens of a *Desmophyllum*; (3) an example of the rare *Stenella imbricata* (J. Y. J.), 50 millim. high, with three or four branches.

3. *PLEUROCORALLIUM JOHNSONI* (Gray). (Plates VI. & VII. figs. 2 & 5.)

Since this species was shortly described by Dr. Gray as a member of the genus *Corallium* (P. Z. S. 1860, p. 127) from a specimen sent by me to the British Museum, larger and more perfect examples have occurred which supply materials for a completer account of it. In an Additional Note on this coral (P. Z. S. 1867, p. 125) Dr. Gray proposed two new genera, *Pleurocorallium* and *Hemicorallium*, assigning the present species to the latter. Later naturalists, not being able to find grounds for two genera, have abandoned one of them and placed the then single species of *Hemicorallium* under *Pleurocorallium*, as the definition of this genus in the Note cited preceded that of the other one. (See Stuart O. Ridley's valuable paper on the arrangement of the Coralliidae, P. Z. S. 1882, p. 222.)

When fully grown, the coral is much and very irregularly branched with an open system of ramification, the flexuous branches extending essentially in one plane, rarely meeting and uniting. Base spreading widely and thinly over the object to which it is attached. Axis compact, stony, white, the surface striated longitudinally; its transverse section elliptical. Cortex (cœnenchyma) cream-coloured, frequently pitted; at the inner surface a ring of ducts (cœnosarcal canals) surrounds the axis. Polype-cells prominent, sessile, wart-like, subhemispherical, about 2 millim. high and 2·5 in diameter; irregularly scattered on the anterior face of the branches from 1 to 5 millim. apart, sometimes in contact, especially at the tips of the branches, which are knobbed with them. The summits have a cycle of eight short lobes, which in the dry state curve over the orifice. The polype have an orange or yellow colour.

Only three forms of spicula have been detected in the cortex and polype-cells:—(1) the double carafe-shaped spicule with two

necks, already described as being found in both the preceding species; (2) the short, stout, cylindrical spicule with two whorls of four rays, the "octoradiate spiculi" of Ridley, also present in the cortex of the two foregoing species, but here the latter is more regular and symmetrical; (3) a form bearing a general resemblance to (1), but with the united bodies more elongate, and each member pear-shaped or poke-like and smooth. This form is peculiar to the present species. (See Plate VII. figs. 2 & 5.)

This species occurs very rarely, but it is met with rather more frequently than any of the others. Only five specimens are known to me, the largest of which, as well as the one first discovered, were presented to the British Museum. The former of these has a height of 210 millim. (8 in.) and a spread of 315 millim. (12 in.). The stem, before it begins to throw off branches, has a thickness of 27 millim. Fortunately the base came up with the rest; it is a thin plate measuring 83 by 70 millim. There are four principal branches, which are again divided and subdivided in an irregular manner. At one part there are three overlapping layers of branches and in another two overlapping layers, but no instance of two branches meeting and uniting.

Another fine specimen in an excellent state of preservation was secured by the Rev. Padre Schmitz for the Seminario Museum, Funchal. It has the same height as the preceding but is not so wide by 50 mm. The coral is curved from side to side, so that the polype-bearing face is convex and the other face concave. The base has been left behind, the stem having given way at a place where it had been much perforated by boring animals. The section here measures 22 millim. by 18. There are five main branches, the longer axes of which measure from 10 to 15 millim. On the posterior side three secondary branches strike off from main branches at angles which are more than right angles above and consequently less below. The specimen is figured on Plate VI.

A third, much smaller specimen is in my possession. The underside of the spreading base, 55 millim. by 40, the longer axis being nearly parallel with the plane of the branches, is flat with a smooth surface, and bears impressions of three species of creeping bryozoa that had settled upon the supporting body before the coral grew over them. I have also one valve of the great sessile cirripede, *Pachylasma giganteum* (Phil.), measuring 36 millim. by 22, the exterior of which is completely coated with the cœnenchyma of the coral, and this has thrown up several polype-cells, but has not secreted a stony basis. This shows that the polypes secrete the hard compact axis simply as a support for the increasing colony.

In M. H. Filhol's work on the submarine explorations of the 'Talisman' (1884), he says that at the Cape Verd Islands, "entre 500 et 600 mètres nous avons rencontré une forme d'alcyonaire extrêmement intéressante au point de vue zoologique, appelée par M. Marion *Coralliopsis perieri*. Elle rappelle beaucoup le *Corallium secundum* de Dana vivant aux îles Fidji." This may have been an example of *Pleurocorallium johnsoni*.

